

Lomb-Scargle Periodogram of Irregularly Sampled Data

▼ Introduction

This application

- generates an irregularly sampled signal of a sum of two sinusoids (i.e. a time vector at irregular intervals, and a signal vector containing a value at each of those times)
- and then generates a [Lomb-Scargle periodogram](#) of that data.

The periodogram correctly identifies the frequencies used to generate the irregularly sampled signal.

> *with(SignalProcessing) :*

▼ Generate Irregularly Sampled Signal

Generate an irregularly spaced vector of times

> $t := \text{sort}(\text{LinearAlgebra}:-\text{RandomVector}(2^{10}, \text{generator} = 0..36.0, \text{datatype} = \text{float}[8]))$

(2.1)

$$t := \begin{bmatrix} 0.0188055128500118 \\ 0.0414380566478605 \\ 0.166832068826428 \\ 0.241751315465190 \\ 0.281530568496056 \\ 0.372118260362270 \\ 0.428474502044690 \\ 0.478195216821090 \\ 0.554523755455982 \\ 0.557536522896682 \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} \quad (2.1)$$

1024 element Vector[column]

Generate a signal using frequencies of 1 Hz and 8 Hz

> $f1 := 1.0 :$
 $f2 := 8.0 :$

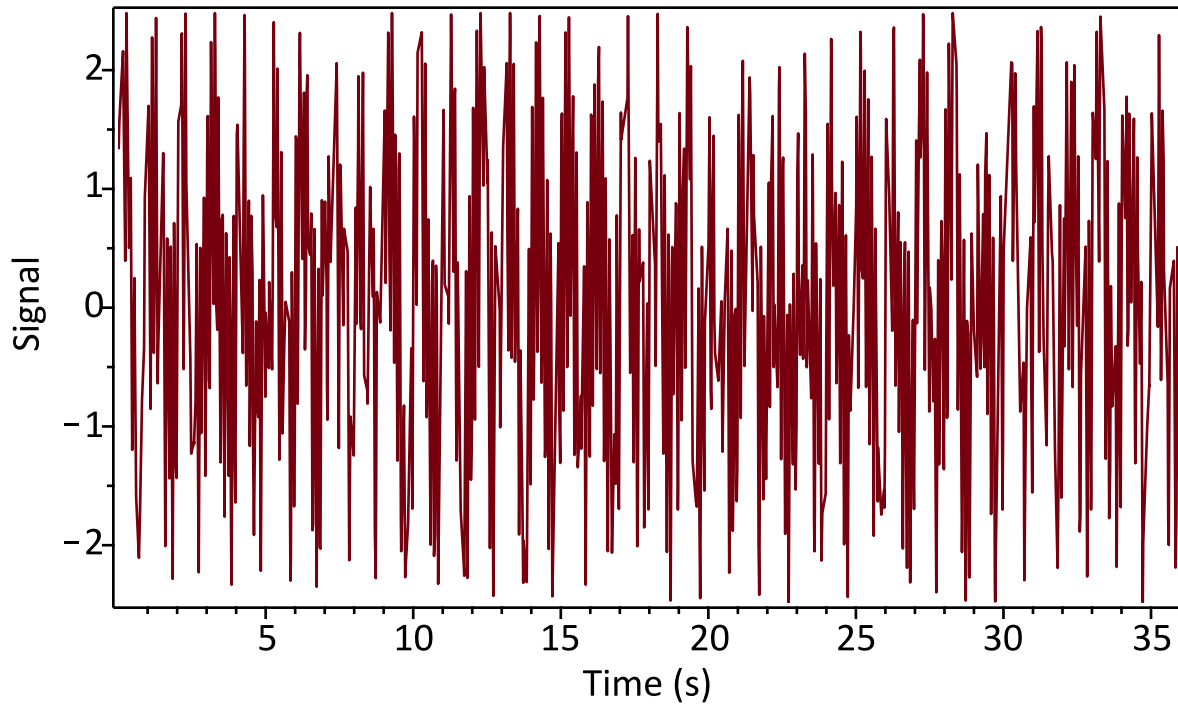
$$s := \text{Vector}(2^{10}, i \rightarrow \sin(f1 \cdot 2 \pi t_i) + 1.5 \sin(f2 \cdot 2 \pi t_i), datatype = float_8)$$

$$s := \begin{bmatrix} 1.33386475064543 \\ 1.56500186777277 \\ 2.15930232856953 \\ 0.394388354775907 \\ 2.48029067225890 \\ 0.503274385800529 \\ 1.09183457152336 \\ -1.19752263527222 \\ 0.249490855220630 \\ 0.0166774537813397 \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} \quad (2.2)$$

1024 element Vector[column]

> $plot(t, s, size = [800, 300], axes = boxed, title = "Irregularly Sampled Signal", labels = ["Time (s)", "Signal"], labeldirections = [horizontal, vertical], titlefont = [Calibri, 16], axesfont = [Calibri], labelfont = [Calibri], thickness = 0)$

Irregularly Sampled Signal



▼ Generate Lomb-Scargle Periodogram

Generate a periodogram assuming that the signal is sampled at each point in the irregularly spaced time vector

```
> LSPeriodogram(t, s, frequencyscale = "Hz", size = [ 800, 300 ], title  
= "Lomb Scargle Periodogram", titlefont = [ Calibri, 16 ])
```

Lomb Scargle Periodogram

